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AUTHOR Noyelle, Thierry J.
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ABSTRACT

This paper attempts to analyze the changing nature of work in today's economy and to investigate employment problems and mobility opportunities for disadvantaged workers. Principal dimensions of employment opportunities in the "old economy" of the 1950s and 1960s are highlighted, and the impact of the emergence of the "new economy" on the aggregate structure of employment opportunities is identified. A short review follows of how major groups of disadvantaged workers have fared vis-a-vis this new structure of employment opportunities. The analysis of the transformation of employment opportunities is refined to show how the postwar expansion of the higher education system and recent technological advances have acted to alter required skills, the process of skill acquisition, and job characteristics. These major conclusions are reached: the trend towards labor market "bifurcation" need not imply that all jobs in the labor market's lower tiers are becoming de-skilled, labor market misadjustments are occurring that require attention, the economy's continuing shift from manual to cognitive processes will continue to place a premium on better schooling and higher level training and retraining, and vocational and higher education institutions will continue to assume increasing importance in opening avenues for upward mobility. (YLB)

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STATE-OF-THE-ART PAPERS

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OFFICE FOR RESEARCH IN HIGH TECHNOLOGY EDUCATION
The University of Tennessee College of Education

Work in a World of High Technology: Problems and Prospects for Economically Disadvantaged Workers

by

Thierry J. Noyelle
Research Scholar
Conservation of Human Resources Project
Columbia University

Office for Research in High Technology Education
428 Claxton Addition, College of Education
The University of Tennessee, Knoxville, TN 37996-3400

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FOREWORD

The Office for Research in High Technology Education at the University of Tennessee, Knoxville, is conducting a program of work on high technology and its implications for education. Funded by the U.S. Department of Education's Office of Vocational and Adult Education, the program addresses the skill requirements and social implications of a technology-oriented society. Issues concerning computer literacy and computer applications are a focus of the program. The balance between the liberal arts and technological skills and the complementary roles they play in enabling people to function in and derive satisfaction from today's high-technology era are also addressed. The program's efforts are targeted at secondary schools, two-year post-secondary institutions, community colleges, universities, industrial training personnel, and other education and training groups.

The program consists of three major components:

At Home In the Office Study - At Home In the Office is an experiment that has placed office workers and equipment in the workers' homes to determine (1) what types of office work can effectively be done at home and (2) the advantages and disadvantages of home work stations. The implications for educators, employers, and employees will be significant, as work at home offers a possible avenue of employment for people living in rural areas, parents of pre-school children, handicapped individuals, and others.

COMTASK Database - COMTASK is a model of a computerized task inventory for high-technology occupations. The outcomes of the COMTASK system include a sampling of task analyses, the demonstration of how these task analyses can be rapidly updated, a manual for conducting task analyses to provide data for the system, and a guide to using the system.

State-of-the-Art Papers - A series of nine papers is being developed to address high technology and economic issues that are of major concern to education. Nine working titles have been selected:

- The Changing Business Environment: Implications for Vocational Curricula
- Computer Literacy in Vocational Education: Perspectives and Directions
- Computer Software for Vocational Education: Development and Evaluation
- Educating for the Future: The Effects of Some Recent Legislation on Secondary Vocational Education
- The Electronic Cottage
- High Technology in Rural Settings
- (Re)Training Adults for New Office and Business Technologies
- Robots, Jobs, and Education
- Work in a World of High Technology: Problems and Prospects for Disadvantaged Workers

Abstract

This paper attempts to uncover how employment shifts to service industries, advances in computer and communications technology, and the postwar development of an extensive vocational, technical, and higher educational system have each acted to transform the structure of job opportunities and required skills, the process of skill acquisition, the process of occupational mobility, and, in the end, the nature of risks for disadvantaged workers. Although the paper is strongly focused on the labor market's demand side, implications for the labor supply are identified throughout.

The paper proceeds in five stages. Principal dimensions of employment opportunities in the "old economy" of the 1950s and 1960s are first highlighted. The impact of the emergence of the "new economy" on the aggregate structure of employment opportunities is then identified, followed by a short review of how major groups of disadvantaged workers have fared vis-à-vis this new structure of employment opportunities. In the subsequent section, the analysis of the transformation of employment opportunities is refined to show how the postwar expansion of the higher educational system and recent technological advances have acted to alter the nature of skills demanded, the process of skill acquisition, and the characteristics of jobs.

In the final section, several major conclusions are derived from this analysis:

(1) The recent tendency towards labor market "bifurcation," exemplified by the widening gap in the social status of various jobs, need not imply that all jobs in the labor market's lower tier are becoming deskilled. While some are, many are being upskilled because of the introduction of high technology, even though the status of those jobs may be in the process of being downgraded. In such cases, upskilling and status downgrading are occurring simultaneously.

(2) Various labor market misadjustments are occurring which call for attention, including but not exclusively through retraining, if new hurdles are to be prevented from arising.

(3) The economy's continuing shift from manual to cognitive processes, both at the workplace and in the sphere of daily life and consumption, will continue to place a premium on better schooling and better, higher level training and retraining (especially in a period of rapid technological change such as the current one).

(4) As the pressure for better education and training continues to be felt and as labor markets continue to transform in the general direction followed during the past two decades or so, vocational and higher education institutions will continue to take on increasing importance in opening avenues for upward mobility, thereby influencing the course of equal employment opportunity.

About the Author

Thierry Noyelle has completed several studies of labor market transformation in the United States. He has coauthored several books, including The Economic Transformation of American Cities (1984), Cities in Transition (1982), Productivité et Qualité de Vie au Travail (1981), and Services/The New Economy (1981). He is currently working on two major studies: a study of changing internal labor markets in large corporations for the Rockefeller Foundation and a study of the effects of technological changes on employment for the Ford Foundation.

About the Editors

This paper has been prepared as part of a series of state-of-the-art papers edited by Lillian A. Clinard, an associate director of The University of Tennessee's Energy, Environment, and Resources Center (EERC), and Mary R. English, a research associate at EERC. The editors, who have been on assignment to the Office for Research in High Technology Education, were responsible for selecting the series' authors, reviewing and coordinating external reviews of the papers, and preparing the papers for release.

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The editors express appreciation to the U.S. Department of Education's Office of Vocational and Adult Education, which also provided a review.

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INTRODUCTION

The importance of high technology in our economy is now understood better than it was just a few years ago. This importance lies not so much in the employment generated directly by industries that create high-tech outputs as in the use of these outputs and the resulting employment across a broad range of industries. This paper is an attempt to uncover how employment shifts to service industries, advances in computer and communications technology, and the postwar development of an extensive vocational, technical, and higher educational system have each acted to transform the structure of job opportunities and required skills, the process of skill acquisition, the process of occupational mobility, and, in the end, the nature of risks for disadvantaged workers.

Because the recent debate on the issue of the economic effects of technological change has too often tended to be oversimplified, it seems appropriate to partially put to rest two of the major controversies surrounding the issue before turning to the paper's substance.

The first controversy is about the quantitative impact of technological change on employment, with a number of observers arguing that Western economies are being threatened by permanent technological underemployment. In this country, leading proponents of this position have been Nobel prizewinner economist Wassily Leontieff and his associate Faye Duchin who, through the use of econometric methods, have attempted to show that even the most optimistic growth scenario would be accompanied by considerable underemployment (Leontieff & Duchin, 1983). Bertrand and Noyelle (1984), reviewing much of the literature written on this issue both

here and in Western Europe, have found that the position taken by Leontieff and Duchin and others is far from shared. Indeed, many studies of technological change are considerably more cautious in their assessments. Leontieff and Duchin's type of projections assumes that we know how to quantify the impact of technological change -- that is, that we know how to quantify and project productivity gains -- which, in actuality, is untrue (Stanback et al., 1981; Bertrand & Noyelle, 1984). This implies neither that underemployment is about to abate nor that technology does not cause worker displacement, but simply that the reasons for underemployment and displacement may ultimately lie elsewhere than in technology's ineluctability -- may lie instead in factors such as depressed demand (Applebaum, 1983) or society's inability to control better the pace of transformation (Noyelle, 1984c). This paper tries to elaborate further some of the dimensions of this argument by showing that displacement is indeed a rather complicated process.

The second controversy concerns the issue of technological change's qualitative impact on skills. This controversy started almost ten years ago when Harry Braverman, a self-taught economist who for many years had been on the editorial board of Monthly Review, published his Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century (Braverman, 1974).

Throughout the twentieth century, according to Braverman, the relentless drive for productivity gains by capitalists had led to an ever finer taylorization of work, a continuous decline in skill requirements, and the endless degradation of work. Technology operated in a largely

monolithic fashion -- as a major ingredient in the general process of taylorization and deskilling; that is, in the process of work degradation. To Braverman's credit, his book contained some brilliant pieces, not the least of which were his attempts to reach beyond labor economists' conventional focus on blue-collar workers and to develop a stronger understanding of the economy's shift to white-collar work and service industries employment. In addition, Braverman's work included a sharp but important warning about the dangers inherent in the very rapid build-up of disproportionately large strata of low-paying jobs in our advanced economy.

It may be argued that Braverman's analysis was influenced by an earlier, qualitatively different phase of computerization during which computers did have a downgrading impact, especially among certain groups of low-level clerical workers (key punchers and the like). But it can also be said that Braverman's gloomy assessment did not fully square either with the steady rise of education in our society or with the general upgrading of the overall occupational structure, as witnessed by the continuing build-up of employment in occupational groupings such as administrators, professionals, and technicians. Indeed, as recent analyses such as those of Attewell (1982), Adler (1983), Adler and Bowers (1983), Osterman (1982, 1983) and Hirshhorn (1984) are showing, Braverman was often simply plain wrong in his assessment of trends and tendencies.

As I try to suggest in this paper, I believe that a good bit of the problem arose from Braverman's overriding tendency to confuse deskilling with what I would call job status degradation. In addition to skills -- that is, the nature of the knowledge demanded by the tasks at hand as well

as the degree of autonomy associated with those tasks -- the status of a job is defined by other attributes. These attributes include the pay and benefits level, the degree of sheltering from labor market competition (sheltering which typically results from unionization, industry specificity of skills, or licensing requirements), the quality of tenure associated with the job (e.g., protection against layoff), the opportunities for upward mobility associated with the job, and so forth. I believe that Braverman often failed to see that what he was observing was a downgrading in a number of these attributes, not necessarily deskilling per se. As a result, Braverman failed to see that in some instances what was occurring was, simultaneously, upskilling and status degradation. Nevertheless, today's debate about work has not fully recovered from Braverman's early formulation.

To analyze the changing nature of work in today's economy, and to investigate employment problems and mobility opportunities for disadvantaged workers, this paper proceeds in five stages. In the next section, principal dimensions of employment opportunities in the "old economy" of the 1950s and 1960s are highlighted. The impact of the emergence of the "new economy" on the aggregate structure of employment opportunities is then identified, followed by a short review of how major groups of disadvantaged workers have fared vis-à-vis this new structure of employment opportunities. In the subsequent section, the analysis of the transformation of employment opportunities is refined to show how the postwar expansion of the higher educational system and recent technological advances have acted to alter the nature of skills demanded, the process of

skill acquisition, and the characteristics of jobs.

As explained in the final section, several major conclusions arise from this analysis. The first is that the recent tendency towards labor market "bifurcation," exemplified by the widening gap in the social status of various jobs (the so-called problem of the "shrinking middle class" [Kuttner, 1983]), need not imply that all jobs in the labor market's lower tier are becoming deskilled. While some lower tier jobs may demand low skills or may even be deskilled, many are not being deskilled, even though their status may be in the process of being downgraded. In those cases, upskilling and status downgrading are occurring simultaneously.

The observation that the introduction of the new technology results in upskilling or skill change leads to a second major conclusion: that various labor market misadjustments are occurring which call for attention, including but not exclusively through retraining, if new hurdles are to be prevented from arising.

The third major conclusion is that the economy's continuing shift from manual to cognitive processes, both at the workplace and in the sphere of daily life and consumption, will continue to place a premium on better schooling and better, higher level training and retraining (especially in a period of rapid technological change such as the current one).

The fourth and last major conclusion is that, as the pressure for better education and training continues to be felt and as labor markets continue to transform in the general direction followed during the past two decades or so, vocational and higher educational institutions will continue to take on increasing importance in opening avenues for upward mobility,

thereby influencing the course of equal employment opportunity. Because the higher educational system is largely unprepared to handle such responsibilities, major institutional changes will be needed if we are to develop training and educational structures that do not discriminate against the disadvantaged but rather contribute to bridging the widening gaps between the labor market's upper and lower tiers.

A final word of warning is in order. The range of issues that could have been treated under the topic suggested by the paper's title is extremely wide. Choices had to be made. The result is a paper which is strongly focused on the demand side of the labor markets, although implications for the labor supply are identified throughout.

A SHORT HISTORICAL DETOUR: EMPLOYMENT OPPORTUNITIES, SKILL ACQUISITION, AND UPWARD MOBILITY IN THE "OLD ECONOMY"

More than ten years ago (January, 1973), the American Telephone and Telegraph Company (the "old" AT&T), the United States Equal Employment Opportunity Commission (EEOC), the U.S. Department of Justice, and the U.S. Department of Labor agreed to a consent decree that became a milestone of EEO enforcement. Not only was AT&T then the largest private sector employer, with nearly a million employees, but between 1965 and 1970 over 2,000 individual cases had been filed with the EEOC charging employment discrimination at the telephone company -- a startling near 10-percent share of all cases filed with the agency! (Northrup & Larson, 1979)

The AT&T-EEO consent decree represented the first major instance in which the EEOC stepped away from the nearly impossible task of litigating discrimination complaints on a case-by-case basis by trying to solve a whole class of complaints at once. The message to other employers was, at the time at least, unequivocal: discrimination in the workplace was illegal, and EEO objectives would be enforced vigorously. The decree was also the first major instance in which financial compensation was sought to redress damages suffered by whole classes of workers who previously had been discriminated against. But more importantly for the purpose of this paper, through this decree AT&T was agreeing to establish detailed employment goals and targets as well as specific hiring and internal promotion procedures which, over time, were meant to help the company eliminate the impact of its earlier discriminatory practices vis-à-vis female and minority workers.

A year later (April, 1974), buoyed by this and earlier successes, the

EEOC could claim another major milestone by getting nine major firms in the steel industry to agree to yet another major consent decree (Ichniowski, 1985). As in the case of the AT&T-EEO decree, the importance of the steel decree lay in part in the sheer number of workers affected, since nearly three-quarters of a million of workers were then employed by the industry. In addition, and contrary to the earlier AT&T-EEO decree, which had been developed with little involvement from (and, for that matter, against the will of) a largely white-male-dominated union, the union's involvement and active contribution had been sought throughout this new decree's negotiation, thus avoiding some of the very troublesome litigation that ensued following the AT&T-EEO decree.

The two decrees, and others developed during that same period, had a number of points in common. First, most dealt with industries dominated by a few large and very large employers on the labor market's demand side (dealing, in the case of the telephone industry, with one regulated monopoly) and with, typically, a few powerful unions on the supply side. In short, these decrees tended to deal with industries in which the discriminating institutions on both the demand and the supply sides of the labor market were easily identifiable and targetable.

Second, these decrees involved industries with firms characterized by strong internal mobility ladders. In such industries, discrimination had been enforced by confining the entry of women and minority workers to industrial departments with short ladders and limited upward mobility opportunities and by forbidding lateral moves (crossovers) from such departments to more favorable ones, while channeling white males toward

the departments offering the best opportunities for upward mobility. It is quite possible that there had been some complicity on the part of largely white-male-dominated unions to preserve such a status quo.

Third, each of these decrees attempted to eliminate discrimination by striking at the core of these arrangements in a fairly similar manner: (a) by extending seniority rights -- which typically had been limited to departmental seniority -- to company-wide seniority, so as to facilitate lateral moves; (b) by establishing specific quotas for particular occupational ranks -- quotas which were to be filled by women and minority workers within a certain time period in order to redress earlier biases, even if that required overriding the seniority rights of white-male workers; and finally, (c) by getting firms to invest additional, often very substantial, training monies to help prepare women and minority workers for the positions that were being opened to them.

On the whole, then, these decrees attempted to both preserve and transform their industries' traditional job ladder systems and training programs so as to make them work in favor of, rather than against, the goal of equal opportunity for the disadvantaged.

These decrees undoubtedly helped redress highly discriminatory work situations, even though the process may have been, at times, slower than some might have expected it to be. But it is also true that these decrees were aimed at solving problems in the very industries and very work settings that the economy was rapidly shifting away from. In the final analysis, <u>these decrees dealt with the past, not with the future</u>, and gave us only limited clues about how to solve labor market inequities arising in

the new world of work.

Indeed, less than ten years after the steel industry-EEO decree had been signed, employment in the industry had been cut by nearly half, seriously limiting that decree's direct and indirect (image-setting) impact. As one of the democratic presidential candidates observed during the 1984 primary campaign, by 1983, MacDonald alone employed more people than U.S. Steel, the largest firm in the industry. Likewise, the gist of the AT&T-EEO decree focused on moving female and minority workers in old-styled blue-collar craft occupations at the very same time that the industry was getting caught in a major technological transformation about to change fundamentally, if not eliminate completely, many of those very occupations (Noyelle, 1983; Freedman, 1984). In addition, and to restate what was noted earlier, the philosophy behind the steel and telephone industry decrees rested on eliminating labor market inequities by opening access for the disadvantaged to "internal labor markets"; that is, to the internal job ladder systems that were characteristic of the large firms and institutions dominating the automobile, steel, or transportation industries; the public utilities; and even public sector agencies throughout most of the 1950s and 1960s (Doeringer & Piore, 1971).

Yet the economy was changing. A "new economy" was emerging. Dominant sectors were increasingly shifting to other areas such as health, education, finance, professional services, and even high technology. Large firms in these newer fast-growing sectors were relying less and less on internal job ladders and internalized training to prepare workers for their various departmental echelons; more and more on the external labor market,

with the vocational, technical, and higher educational system producing an increasingly fine-grained labor pool. Finally, technological changes in the making were further shifting the nature of skills demanded by the economy and, in the process, further accelerating the shift to external training.

THE "NEW ECONOMY": THE IMPACT ON OCCUPATIONAL STRUCTURES OF THE SHIFT TO SERVICE INDUSTRIES AND WHITE-COLLAR EMPLOYMENT

As the shift from the "old" to the "new" economy proceeded, changes in job opportunities came about in three major ways (e.g., Stanback & Noyelle, 1982; Attewell, 1983):

- As a result of the sheer employment shift away from goods industries toward service industries; that is, toward industries with occupational mixes different from those of older industries (hereafter, the "industry shift").
- As a result of the widespread, secular tendency, induced by productivity increases, for a shift from blue-collar toward white-collar occupations to take place within both service and goods industries (hereafter, the "occupational shift").
- As a result of the transformation of the skills required for a given occupation, due to recent technological advances and changes in the division of labor within organizations (hereafter, the "skill shift").

It is not the purpose of this paper to address in detail structural shifts in the postwar economy. But a few words are in order to help explain the aggregate employment changes that have unfolded throughout the postwar period, since it is against this background that recent technological advances affecting work have taken place. The industry shift and occupational shift effects mentioned above are reviewed here. The impact of recent technological changes on jobs and skills is assessed later in the paper.

The postwar economy has been characterized by a steady employment shift to the services industries, as shown, for example, by the employment distribution presented in Table 1. By 1982, more than seven out of every ten jobs were in service industries, as against five and one-half jobs out of every ten in 1947. Three major structural changes help to explain this trend.

Table 1. Percentage Shares of Full-Time-Equivalent Employment and Gross National Product by Industry; 1947, 1969, and 1982

	1947		1969		1982	
	Empl	GNP	Empl	GNP	Empl	GNP
Non-service industries	43.4	37.4	35.1	36.0	28.7	30.2
Agriculture, mining, and construction	11.1	12.9	7.4	10.4	7.2	7.6
Manufacturing	32.3	24.5	27.7	25.6	21.5	22.6
Service industries	56.6	62.6	64.9	64.0	71.3	69.8
Distributive services	13.5	13.4	11.0	15.0	11.7	16.5
Producer services	6.1	15.5	10.0	18.3	13.9	22.7
Retail and other consumer services	20.2	16.6	18.8	13.1	19.2	12.2
Nonprofit services	2.6	2.7	4.7	3.6	7.5	5.3
Public sector	14.2	14.6	20.5	14.1	19.1	12.0
All industries						
Percentage[a]	100.0	100.0	100.0	100.0	100.0	100.0
Number[b]	48,040	468.4	71,405	1,079.0	84,712	1,485.4

[a]Columns do not add fully to 100.0 percent because of a "rest of the world and residual" category not shown.

[b]Full-time-equivalent employees in thousands. GNP in billions of 1972 dollars.

Source: Data compiled from U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts of the U.S., 1929-1974 and Survey of Current Business, July 1983, Tables 6.2B and 6.8B, by T. M. Stanback, Jr. et al., 1981, in Services/The New Economy, Totowa, NJ: Allanheld, Osmun.

First, the postwar period witnessed the breakdown of local and regional barriers and the development of nationwide consumer markets in which virtually all consumer goods and services came to be promoted and distributed on a coast-to-coast basis. In terms of services, the result was the development of nationwide distribution and retailing networks, the emergence of new marketing modes, and the buildup of employment in related industries. In addition, rapidly increasing segmentation in the marketplace beginning in the late 1960s resulted in the further development of services such as engineering, design, and styling needed to translate product differentiation into new products and services. This brought about employment growth in these service functions, either in the central offices of large corporations or in producer service firms.

Second, the postwar period was marked by the increasing importance of the large corporation. The large corporation's emphasis on generating firmwide scale economies led to productivity advances in factories through the centralization and development of service functions once carried out at the plant level. The result was, again, employment and output growth both in the central offices of firms and in producer service firms.

Third, the rapid opening of the U.S. economy to international competition, especially after the first oil shock of the early 1970s, accelerated the move of capital out of older sectors into newer ones -- mostly high-tech manufacturing and services — while the increasing expansion of the international market accelerated the development of service functions needed to run firms operating more and more on a world scale.

In short, these and other developments combined to produce a dramatic shift to services in the domestic economy, a shift reflecting a transformation in both what and how the economy produces (Stanback et al., 1981; Ginzberg & Vojta, 1981; Forbes, 1983). In terms of what the economy produces (final output), the shift to services came from growth in a number of free-standing services, especially health and education, as well as growth in services such as specialized retailing, consumer financing, and product maintenance that are provided along with goods. In terms of how the economy produces (intermediate input), the shift to the services came with services such as finance, accounting, management consulting, distribution, transportation, advertising, and a whole host of services used as intermediate inputs in economic processes.

Empirically, these shifts can be assessed through the breakdown of employment and output shown in Table 1 for the years 1947, 1969, and 1982. The two sets of measures are based on a classification of services which distinguishes among five major groups (from Stanback et al., 1981):

- The distributive services — transportation, communications, utilities, and wholesaling.
- The producer services — finance, insurance, accounting, legal counsel, advertising, management consulting, and so forth.
- The retail and other consumer services — including, in addition to retailing, hotels, car rentals, and movie theaters.
- The nonprofit services — mostly higher education and health.
- The public sector services.

The first two groups of services represent primarily intermediate outputs. Services included in the third group are mostly final outputs,

and those in the last two groups are a good bit of both final and intermediate outputs. This breakdown has various limitations, as discussed in greater detail in both Stanback et al. (1981) and Noyelle and Stanback (1984). From the reader's point of view, however, suffice it to note here that the classification tends to underestimate the true growth of the medical and educational sectors, since almost as large a share of employment in those sectors as that shown for the nonprofit sector is subsumed in the public sector.

Very simply, Table 1 shows the following:

- In terms of employment, shifts have occurred mostly because of disproportionate employment growth — at first, in the public sector (during the first two decades of the postwar period), and later, in the health and education sectors and in the producer service sector.

- In terms of output, shifts came principally from the two groups of services most directly identifiable as intermediate inputs — the distributive services and the producer services nearly 40 percent between 1947 and 1982!

The significance of these industry shifts lies, of course, in the changes in employment opportunities resulting from the rise of industries with different occupational mixes. In addition, the industry shifts have been compounded by productivity-induced occupational shifts which have taken place throughout most of the postwar period, at first in blue-collar areas of work and recently, as a result of the diffusion of the new computer-based technology, in clerical and low-level white-collar areas. On the whole, productivity increases have further acted to shift the occupational structure away from blue-collar employment and toward white-collar and service worker employment.

The aggregate outcome of the two effects -- the industry shift and the

occupational shift -- is summarized in Table 2, in which the distribution of employed workers by occupations has been computed for 1960, 1970, and 1982. This table indicates rather dramatic aggregate shifts throughout the period, with a near 10-percent shift in share away from blue-collar areas of employment toward white-collar and service worker occupations.

What Table 2 does not show well, however, is how the two effects -- the industry shift and the occupational shift -- have acted separately to bring about such a substantial transformation. This is shown in Table 3 by way of shift-share analyses for the periods 1970-76 and 1976-82.

Columns 3 and 6 of Table 3 present actual net change (or "aggregate shift"); that is, the true growth or decline in employment in each occupation. These changes reflect both industry growth and changes in the relative importance of given occupations in each industry. Columns 1 and 4 indicate employment changes that would have occurred if the occupational composition (i.e., the share of employment accounted for by each occupation) in individual industries had remained the same; they thus reflect only the effect of the industry shift. The differences between columns 3 and 1 and between columns 6 and 4 reflect solely the effect of the occupational shift (shown in columns 2 and 5, respectively); they measure the extent to which actual occupational changes exceeded or failed to attain the levels that would have been expected had there been no change in occupational composition within the various industry groups.

The calculations in Table 3 were developed for each of the major industry groups used in Table 1 and were summarized for two major

Table 2. Percentage Distribution of Employed Workers by Occupation; 1960, 1970, and 1982

	1960	1970	1982
White-collar and service workers	60.3	63.3	69.5
Managers and administrators	11.7	11.0	11.9
Professionals and technicians	12.3	14.8	17.5
Sales workers	7.0	6.4	6.8
Clerical workers	16.1	18.2	19.1
Service workers	13.2	12.9	14.2
Blue-collar workers	39.7	36.7	30.5
Craft workers	14.1	13.4	12.6
Operatives	19.7	18.4	13.2
Laborers	5.9	4.9	4.7
Total employed (in 1,000)	60,602	75,551	96,803

Note: Farm workers are excluded.

Source: Data compiled by U.S. Bureau of Labor Statistics in Bulletin 2096; Employment and Earnings, monthly; and unpublished data. From Table 643 in Statistical Abstract of the United States (1984).

Table 3. Analysis of Employment Change by Occupation in Service and Non-Service Industries; 1970-76 and 1976-82

	1970-76			1976-82		
	Industry Shift (1)	Occupational Shift (2)	Aggregate Shift--Actual Net Change (3)	Industry Shift (4)	Occupational Shift (5)	Aggregate Shift--Actual Net Change (6)
Non-Service Industries						
Total	181,705	0	181,705	2,826,515	0	2,826,515
Managers and administrators	35,771	97,699	133,470	535,075	-1,073,894	-538,819
Professionals and technicians	-4,544	194,318	189,774	221,443	549,473	770,916
Sales workers	-7,952	15,268	7,316	41,846	12,526	54,372
Clerical workers	-12,497	-69,132	-81,629	238,684	762,988	1,001,072
Service workers	-3,281	-65,087	-68,368	35,812	17,600	53,412
Craft workers	191,859	73,593	265,452	614,431	899,765	1,574,196
Operatives	-82,570	-118,849	-201,891	773,386	-1,148,778	-375,392
Laborers	64,919	-127,810	-62,891	366,124	-15,966	350,158
Service Industries						
Total	8,658,605	0	8,658,605	15,141,315	0	15,141,315
Managers and administrators	960,953	483,923	1,444,876	1,733,231	366,246	2,099,477
Professionals and technicians	2,244,786	193,011	2,437,797	4,272,077	-1,014,363	3,257,714
Sales workers	601,705	-126,106	475,599	777,983	367,025	1,155,008
Clerical workers	1,852,793	-56,452	1,796,341	3,964,004	386,232	4,360,236
Service workers	2,094,782	-631,501	1,463,281	2,270,609	978,647	3,284,543
Craft workers	366,780	153,546	520,326	845,658	-376,007	470,111
Operatives	338,959	-75,433	263,526	832,914	-626,737	206,177
Laborers	197,847	59,012	256,859	394,954	-82,505	339,781

Note: Non-service industries include mining, construction, and manufacturing. Service industries include distributive, producer, retail and consumer, nonprofit, and public sector services. For definitions of "industry shift," "occupational shift," and "aggregate shift--actual net change," see text. The 1970-76 and 1976-82 periods are not fully comparable, due to changes in the data bases used to evaluate the shifts.

Source: 1970-76 data compiled from U.S. Bureau of Labor Statistics, Office of Occupational Forecasting, National Industry-Occupational Matrix, 1970 and 1976, by T. M. Stanback, Jr., and T. J. Noyelle, 1982, in Cities in Transition, Totowa, NJ: Allanheld, Osmun, Table 3.4. 1976-82 data compiled from U.S. Bureau of Labor Statistics, Office of Occupational Forecasting, National Industry-Occupational Matrix, 1976, and Current Population Survey, Occupational Industry Tables, Selected Data, 1982.

groupings: non-service and service industries.* The calculations for the second period are not as accurate as those developed for the first period, due to changes in the data base between 1976 and 1982 (data from the Office of Occupational Forecasting, for 1976; from the Current Population Survey, for 1982) and should be looked at simply as an indication of trends.

The results are extremely interesting. The bulk of the change during both periods came from an employment build-up in the services industries: 8,658,605 net new jobs in service industries as against 181,705 in non-service industries during the first period; 15,141,315 as against 2,826,515, respectively, during the most recent period.

Detailed findings for the period 1970-76 are fairly clear. In terms of the non-service industries, the results shown in the industry shift column were dominated by a strong employment buildup among craft workers and a strong decline among operatives -- reflecting, presumably, the economy's shift out of older industries such as textiles, garment, consumer electronics in which operatives tended to dominate, and greater relative specialization in higher value-added manufacturing in which craft workers were more important. In terms of the occupational shift, there was a substantial trend toward the employment of professionals, technicians, managers, and administrators and away from the employment of operatives, service workers, and laborers, confirming the general movement toward greater emphasis on administrative and developmental functions within the

*Non-service industries include agriculture, mining, construction, and manufacturing. Service industries include distributive, producer, and retail industries and other consumer, nonprofit, and public-sector services.

corporate organization of the sort discussed earlier in this section. The finding that clerical work declined slightly in relative importance, reversing a trend toward relatively more rapid growth in the employment of clerical workers during the 1960s (not shown here, but presented in Stanback & Novelle, 1982, Table 3.4, pp. 36-37), suggests that the effect of the new office technology was beginning to be felt by the early 1970s.

In terms of the service industries, the industry shift column suggests, not surprisingly, an across-the-board employment buildup, especially in those occupations that traditionally have dominated the service industries: managers and administrators, professionals and technicians, and also clerical and service workers. As in the case of the non-service industries, the occupational shift column indicates a shift toward increased relative employment of managers, administrators, professionals, and technicians (expected from the buildup of administrative and technical staffs) but a shift away from clerical and service workers (indicative, again, of the impact of the new technology on productivity among these lower level workers).

Detailed findings for the second period are slightly ambiguous, probably due to problems resulting from using two different data bases for these calculations. In terms of occupational shifts, however, there was a continuing shift away from operative and laborer positions and toward professionals, technicians, and craft workers. In addition, Table 3 suggests a shift away from managers and administrators in non-service industries, which may simply reflect widespread cuts among supervisors and middle-level managers in manufacturing industries during the 1980-82

recession. Among service industries, column 5 suggests a continuing occupational shift away from blue-collar positions, and, interestingly enough, the beginning of a shift away from professional and technical workers. The detailed industry data (not shown here) suggest that this latter trend is beginning to reflect the strong impact of the new office technology on middle-level skills (e.g., loan rating, underwriting, etc.).

In concluding this review of major shifts, two major sets of findings must be remembered. The first finding is that the period of the 1970s and early 1980s has been marked by a major shift away from blue-collar occupations, both because of retrenchment in smokestack industries and because of productivity-induced occupational shifts which make it possible to produce the same amounts of goods and services with less labor input from blue-collar workers. As Stanback and Noyelle (1982), Kuttner (1983), and others have noted, this relative shrinking of the blue-collar labor force, with its middle-range earnings and middle-class ways of living, has been a major contributing factor to the recent tendency toward social bifurcation. The second finding is that several of the occupational shifts presented in the shift-share analysis may support the oft-heard contention that office automation has been having a heavy impact -- first, on lower level clerical workers and more recently, on higher level clerical, technical, and professional personnel.

THE EMPLOYMENT OF DISADVANTAGED WORKERS IN THE NEW INDUSTRY-OCCUPATIONAL MATRIX

With this broad-based identification of principal postwar changes in employment opportunities now completed, it is helpful to step aside temporarily and take a look at where major groups of disadvantaged workers have found work in the "new economy" and under which conditions. Only then will we be in a position to focus the argument on those educational, technological, or institutional changes that may be affecting the opportunities most critical to such workers.

In the chapter on "Labor Market Characteristics of a Service-Oriented Economy," Stanback and Noyelle (1982) analyzed several measures of employment characteristics in each of the major industry-occupational cells of the economy in 1975. These included such measures as the employment share of women in each industry-occupational cell, the employment share of minority workers (both sexes) in each industry-occupational cell, the earnings level of each industry-occupational cell relative to the national average, and the share of less than full-time, full-year employment for each of the cells. Unfortunately, a lack of proper data impedes the updating of these measures. Indications are, however, that these principal characteristics of employment have changed little since the mid-1970s.

Stanback and Noyelle's findings were hardly surprising. On the whole, and with a few exceptions discussed further below, female and minority workers remained overly concentrated in occupations demanding less skill, offering lower pay, and most often characterized by greater part-timing. This was so despite advances made as a result of the enforcement of equal employment opportunity, if not in recent years, at least until the mid-1970s.

Indeed, Stanback and Noyelle's findings were confirmed by a more recent analysis carried out by Stanback (1983) using EEO-1 report data. Some of Stanback's data are summarized in Table 4. EEO-1 reports are filed with the EEOC annually by firms with establishments employing 100 or more workers (50 or more in the case of establishments working on federal contracts). These reports include data showing the sex-race occupational composition of the firm. Since reporting is mandatory for large or very large firms only -- that is, for firms that traditionally have been under the greatest pressure to reduce discrimination and, for that matter, have been the main targets of the EEOC's efforts over the past two decades -- the EEO-1 report data tend to show the most favorable side of the labor market. Comparing data for both 1966 and 1978, Stanback found, on the positive side, both continued growth in the share of women and minority workers employed by EEO firms and some, if limited, favorable occupational shifts, most notably:

- A shift of minority men away from the lowest paid laborer and service worker occupations, mostly toward craftsmen and operative positions.
- Significant gains of minority women in clerical positions.
- A slight decrease in the concentration of white women in clerical positions accompanied with gains in professional and technical positions.

On the negative side, however, Stanback also found very strong indications that sexual and racial labeling of most occupations remained prevalent. Thus, white males remained heavily represented in the relatively well-paid managerial, professional, and technical occupations in virtually all industries; in sales worker positions in most industries

Table 4. Major Groups of Workers in EEO Reporting Firms, by Sex, Race, and Occupation; 1978 and 1966

	All EEO-Firm Employees Distributed by Occupation		Normalized Shares							
			White Male		White Female		Minority Male		Minority Female	
	1978	1966	1978	1966	1978	1966	1978	1966	1978	1966
Managers and administrators	10.8	8.2	1.5	1.46	0.48	0.31	0.49	0.31	0.23	0.10
Professionals	8.6	6.6	1.21	1.36	0.96	0.45	0.51	0.32	0.51	0.14
Technicians	5.0	4.5	1.10	1.06	0.98	0.97	0.68	0.40	0.86	0.56
Sales workers	8.8	7.1	0.88	1.04	1.39	1.30	0.48	0.25	0.70	0.69
Clerical workers	15.6	16.7	0.30	0.42	2.16	2.44	0.32	0.21	1.68	1.21
Craft workers	12.6	14.2	1.58	1.44	0.21	0.20	1.16	0.60	0.17	0.21
Operatives	21.1	25.4	1.04	1.00	0.75	0.85	1.51	1.38	1.09	1.00
Laborers	8.5	9.7	0.89	0.86	0.74	0.66	2.11	2.90	1.33	1.49
Service workers	9.0	7.7	0.60	0.70	1.21	1.18	1.49	2.12	2.04	3.27
	100.0	100.0								
% of EEO employed			50.2	60.6	31.7	28.0	10.3	7.9	7.9	3.5

Note: First two columns of the table show the distribution of all EEO-firm employees (all sex and race combined) by occupations for 1966 and 1978 respectively. These two columns give an indication of the changing relative importance of the major occupations in EEO reporting firms between 1966 and 1978. The normalized shares of major sex race groups of workers shown for both 1966 and 1978 in the remainder of the table were computed by dividing the share of employment held by each major sex race group of worker in each occupation by that same group's share of all employment in EEO reporting firms (shown on the last line of the table). An index below 1.00 indicates underrepresentation; an index above 1.00, overrepresentation. Absence of discrimination results in an index of 1.00. Occupational groupings demonstrating the greatest changes between 1966 and 1978 for white female, minority male and minority female are underlined for emphasis.

Source: Data compiled from U.S. Equal Employment Opportunity Commission, EEO-1 Report on Minorities and Women in Private Industry, 1978 and 1966, by T. M. Stanback, Jr., January, 1983, in Occupational Structure and Women and Minority Employment in Large and Medium Sized Firms: A Look at the EEO Data, Interim Report to the Rockefeller Foundation.

(most store cashiers are counted as clerical workers); and in skilled blue-collar jobs. Despite gains elsewhere, minority males remained heavily concentrated in laborer positions. Their inroads into craft and operative positions appeared to be working largely at counterpurposes with the shifts unfolding in the larger economy, yielding only limited long-term gains for them in an economy that increasingly was shifting away from these very occupations. Indeed, a most serious problem among minority males appeared to lie in their failure to enter many of the mainstream occupations of the service industries. Finally, while both white and minority females had succeeded in entering the growing service industries in large numbers, only white women had made significant gains in other than service or clerical worker positions.

To conclude, the overall impression derived from these analyses is that, despite nominal and at times vigorous EEO enforcement during the 1970s, and notwithstanding reasonable progress achieved by "professional women" (mostly white women), traditional groups of disadvantaged workers remained largely isolated -- if not stuck -- in the lower tiers of the labor market.

Why is this so? Part of the answer lies, of course, in the point mentioned earlier in this paper: that EEO efforts during the 1970s tended, more often than not, to be focused on the shrinking rather than the growing sectors of the economy. But this is only part of the answer. The other half of the story is that educational and technological changes have altered the way in which workers have traditionally moved up the opportunity ladder. In the absence of correcting mechanisms, such changes

appear to have only added new hurdles to old ones for many disadvantaged workers who either are stuck in the lower echelons of the labor market or are even unable to enter the labor market. I shall now review these changes in order to assess where corrections might be instituted to help the disadvantaged improve their situations.

Looking back at the record of the early postwar period, it is striking to see the extent to which most firms used to rely on internal labor market structures to prepare and move workers in order to staff the ranks of their organizations (Noyelle, 1983; Noyelle, 1984a). This was true not simply of the manufacturing giants which typified the era -- say, the IBMs and the GMs -- but also of many types and sizes of firms, including those in the service sector.

In the insurance industry, for example, most workers entered the job ladder at the bottom of the organization, straight out of high school; then, by means of on-the-job training and gradual seniority, they would move up through the ranks as they matured. For the most successful employees, this could mean moving in stages from an entry-level clerical position to a professional position -- from, say, messenger or file clerk to statistical clerk or claim examiner and even to assistant underwriter or underwriter. In the department-store industry, workers would enter as stockroom clerks and then move on to become sales clerks, commissioned salespersons in high-ticket departments, or even (after passing through the proper echelons) department managers or buyers. The telecommunications industry, as noted earlier in this paper, was also characterized by considerable internal laddering, even though some of this might have been highly discriminatory (Noyelle, 1984a; 1983).

Other examples abound, but the case need not be overstated. One

reason for this extensive internal laddering was simply that beyond primary and secondary schooling, formal educational and training institutions had only limited capacities to prepare workers in the numbers and with the skills demanded to staff the various corporate echelons. Institutionally based vocational training, let alone college training, remained the exception. Recall that by the mid-1950s only slightly more than a third of the 25-years-old-and-over population had completed high school! Today, by comparison, less than a third of the same age group has not graduated from high school (U.S. Statistical Abstract, 1984).

There is considerable evidence that these mechanisms of on-the-job skill acquisition and internal upward mobility have been considerably weakened and transformed since the 1960s. Concretely, this means that one no longer becomes a buyer for a department store by starting out as a sales clerk (Noyelle, 1983). Likewise, one no longer becomes an insurance executive by starting out as a messenger (Noyelle, 1984a; 1984b). Lastly, it may soon be the case that one no longer has access to craft and other higher level positions at the telephone company simply by entering at the bottom of the ladder and by remaining with the company (Noyelle, 1983; Freedman, 1984).

The reasons for this breakdown in traditional mobility patterns are numerous, but they mostly add up to an increasing pressure on firms to externalize their training processes, to rely more and more on the external labor markets in order to staff their ranks, and, accordingly, to rearrange the way they hire and promote people. The result is a broad-based tendency toward the dismantling of internal labor markets and a dramatic change in

the hurdles and opportunities encountered by disadvantaged workers. I shall now review three major components of the dynamics that are at work: the postwar expansion of higher education, the impact of technological change on the transformation of skills, and the tendency for technological change to reinforce the trend toward the de-linking of job sequences.

The first source of change is the expansion of the higher educational system throughout the postwar years. This expansion, by changing so radically the labor supply's makeup, resulted in pressure on all firms to adjust their hiring practices to a labor supply that increasingly was differentiated according to various grades and shades of education. Firms have long felt pressed to externalize training, if only because this would lower their individual costs. But during the postwar period, the tendency to externalize training began taking on a life of its own, by responding to the formidable development of the vocational-technical and higher educational systems. Suffice it here to recall that during the 1960s and 1970s college enrollment more than tripled, from 3.5 million to well over 10 million. Thus, while only slightly over a tenth (11.0 percent) of those in the 25-to-29-years-old bracket had received 4 years or more of college education in 1960, by 1980 their share had risen to 23.3 percent! (U.S. Statistical Abstract, 1984)

The result was a major shift to outside hiring, at first especially among administrative, professional, and managerial personnel -- the so-called exempt workers -- but more recently among lower level employees also, particularly in response to the development of two-year college systems during the 1970s. Hence, by the mid- and late-1970s it was not

unusual to see firms hiring at three, sometimes even four, entry levels: for instance, at the high school level for bottom entry positions, at the two-year community college level for higher level clerical or craft positions, at the four-year college level further up in the organization, and even at the graduate school level for high-level professional or managerial positions. Simultaneously, linkages among the various job layers within organizations were being weakened, as incentives increasingly shifted from in-house training toward the hiring of outside candidates. Clearly, the 1970s represented a watershed as the cumulative effect of three or four decades of the vocational and higher educational system's buildup was finally felt massively on the supply side of the labor market.

The second major source of change is rooted in the new technology's rapid diffusion, its impact on the technical division of labor, and its impact on skill. Vast areas of work in the middle range of the occupational structure -- that is, work ranging from clerical positions (or even blue-collar craft jobs) to lower level professional positions -- are being fundamentally transformed and reorganized around the processing of codified information through interaction with computerized systems. Often, this results in both an upskilling and a kind of universalization or homogenization of the skills demanded across many industries, thereby contributing to increased training needs but also to the externalization of training for many middle-level workers. Clearly, a central issue in the current debate about training is the need for more sophisticated training institutions that can better address the training needs of this middle range of occupations -- a range of occupations which, in their old

configurations in the old industrial economy, had never been brought systematically within the purview of formal training processes. These were jobs for which skill training was traditionally provided on the job, as part of internal labor market mechanisms. Thus, the institutions most directly concerned with this new demand appear to be the high schools, the vocational education centers, the community colleges, and even, perhaps, the four-year colleges -- that is, the institutions that are responsible for preparing and training those whom we might call, in a very loose sense, the paraprofessionals of the high-tech economy.

In concrete terms, what this means is that a number of seemingly diverse jobs (e.g., that of the bank clerk who processes letters of credit or fund transfers on a computerized system, that of the insurance claims examiner, that of the airline reservation and ticketing agent and even that of the telephone company employee who routes and manages traffic flows through switches) are becoming both somewhat more demanding and also increasingly similar in terms of their needed skills, even though these industries' types of businesses remain very different. Upskilling comes from the fact that work on computerized systems puts a higher premium on analytical knowledge and comprehensive knowlege: on the one hand, employees need a working understanding of the algorithmic decisionmaking procedures used in systems; on the other, the reintegration of previously parcelized tasks demands a more encompassing understanding of one's job in relation to the firm's entire work process (Bertrand & Noyelle, 1984; Noyelle, 1984a, 1984b; Hirshhorn, 1984; Attewell, 1983; Adler, 1983).

One could expect that the rise in skill levels and training needs

would strengthen the labor market position of certain groups of better trained workers. This is not necessarily the case, however: the concomitant universalization and homogenization of skills, especially in a context of weakening unionization, ultimately weaken the degree of sheltering once associated with the specificity of many of those skills, thereby allowing employers to open up new labor markets. In the resulting increased labor market competition lies the answer to the seeming paradox that upskilling may, in the end, be associated with a downgrading of job status.

The third major source of change arises from the fact that current technological change tends to reinforce the de-linking of jobs within organizations, already observed as a consequence of expanded vocational and higher educational systems. The reasons for this are at least twofold. First, the introduction of computerized systems often eliminates some of the tasks once embodied in occupations that served as intermediate echelons in the corporate structure. In the insurance industry, for example, intermediate occupations such as policy raters have been largely eliminated by computerized systems. In department stores, many of the lower level supervisory functions that used to be organized around the control of merchandise stocks and flows have been made redundant by technology. Similar examples abound in banking, telecommunications, and other industries (Abblebaum, 1984; Noyelle, 1984a, 1984b). The result is a widening in the gaps between key occupational strata.

A second reason is that in many of the service industries, technology

is making it increasingly feasible and cost efficient to separate spatially the so-called back office functions (dominated by clerical and service worker occupations) from "front office functions" (dominated by technical, professional, or managerial occupations), thereby further breaking the spatial links that used to exist when entire departments, from the bottom up, were in the same physical location. The result, of course, is that even in those instances where functional linkages have been retained, spatial barriers make mobility increasingly difficult to achieve.

CONCLUSION

The magnitude of the transformation under way is considerable, and this paper does not even begin to do justice to the many often subtle, complex, and farreaching changes that are taking place. Nevertheless, there is a need to highlight and conceptualize some of the implications of the trends unfolding for educators, trainers, and policymakers as they rethink training and education, their importance in improving the fate of the disadvantaged, and their role in defining workers' positions in the labor market.

The first major conclusion is that, by increasing labor market competition through skill transformation, technological change may indeed be contributing to the downgrading of job status characteristics such as earnings, labor market sheltering, and opportunities for upward mobility, and, as a result, may very well be aggravating the tendency toward "labor market bifurcation" already inherent in the retrogression of blue-collar employment associated with the shrinking smokestack industries. This, however, does not necessarily imply that the occupations most directly affected by current technological change are being deskilled. Indeed, it appears that in a large number of cases, this relative downgrading of job status (which of course need not be permanent) is occurring simultaneously with skill upgrading.

The observation that technological change results in upskilling, or at least in skill changes, leads to a second major conclusion: that various labor market misadjustments are occurring which call for attention if new hurdles are to be prevented from arising. Two principal types of

disruption come to mind. The first raises the issue of retraining among older workers; the second, the issue of changing entry opportunities for certain groups of workers.

In the case of the telecommunications industry, for example, switch attendants who used to need considerable electromechanical skills to operate and repair the old telephone switches now need very different sets of skills -- mostly of a programming and computer-testing variety -- to work on electronic equipment. This transformation of skills is not very different from that which is occurring in factories, where skilled machine operators must now learn how to program Numerically-Controlled (NC) machines or similar equipment. Yet the implication of this skill transformation is not simply that many older workers need retraining if they are to become proficient with the new technology (and obviously, large numbers have already been retrained). This transformation also implies that in those situations where retraining is insufficient to solve displacement problems, there may be a need to better control the pace of technological change in order to minimize the social costs of displacement (Noyelle, 1984c). Indeed, there is considerable evidence that for social, cultural, and economic reasons it is rather difficult to retrain steel workers, auto workers, and the like into bank clerks, insurance clerks, or computer programmers.

The second type of labor market disruption may arise when technology, through upgrading, almost totally eliminates large numbers of traditional, low-skilled, entry-level positions. This is what is happening, for example, with messenger and file clerk jobs in the "back offices" of banks,

insurance companies, public utilities, and other white-collar industries. As one large New York insurer reported recently, "Back in 1970, we used to hire nearly 2,000 kids straight out of high school every summer to staff low level clerical positions; today [1983], we hire at most 100 or so high school kids. Most entry takes place now at a higher, typically community college level or equivalent, straight into claim examiner or like clerical positions" (Noyelle, 1984b).

Once generalized, the implications of this trend for certain groups of workers cannot be underestimated. In a recent study to assess the impact of such transformation on New York City's youth labor market, Bailey and Waldinger (1984) found that of the nearly 40,000 jobs lost by youths during the 1970s, half of the losses came as a result of the sheer contraction of the city's economy, and the other half -- that is, nearly 20,000 jobs! -- came as a result of the elimination of filing clerk, messenger clerk, and like positions in local/public utilities (telephone, gas, and electric) and in banks and insurance companies. These losses, beyond their sheer magnitude, also meant that major entry positions for youths in the labor market had been eliminated and that their opportunities for entry into the labor market were now confined largely to low-level jobs in the retail and consumer service sectors -- that is, to jobs in sectors with, typically, some of the most limited opportunities for upward mobility.

In addition, many of these back office jobs in white-collar industries, having been restructured through computerization, are being relocated outside the central districts of very large cities such as New York, Los Angeles, or Chicago. The greatest impact of this geographic

dimension of the back office's transformation appears to be on minority populations, who are prime residents of the inner city (Noyelle, 1984b). The implication here is that complex labor market shifts are under way as a direct result of technological change, and these shifts, if not attended to, may result in new employment hurdles -- especially for youths and minorities.

The third major conclusion is that, notwithstanding the fact that the economy will continue to produce large numbers of jobs demanding low-level skills, the general tendency to shift from manual to cognitive processes both in the workplace and in the sphere of daily life and consumption makes better basic schooling more necessary than ever before. Not only has the high school diploma become the proof of basic socialization required by employers as a precondition of employment, but the move toward increasing use of teletex and televideo systems -- whether for home banking, home shopping, or perhaps even electronic work at home -- will place the less than fully literate person increasingly at a disadvantage.

The fourth major conclusion is that as skill acquisition becomes increasingly externalized out of firms and out of the labor market, the role which vocational and higher educational systems play in employment opportunity and mobility becomes all the more critical. With this observation, the paper comes almost full circle. Increasingly, workers' positions in the labor market are determined prior to their entries into the labor market, in the course of their access to the vocational and higher educational systems. This stands in sharp contrast with the way employment opportunities used to be determined in the "old economy."

It is my impression that the vocational and higher educational systems will need to undergo fundamental changes if they are to respond to these new pressures; in other words, if they are to provide both a more efficient and a fairer vehicle for upward mobility. Most likely, what is called for is an evolution toward a truly continuing educational system -- one that is more equitable, more flexible, better adapted to shorter term passages, more ubiquitous, and perhaps less specialized in orientation than it has traditionally been. In this way all workers, regardless of sex, race, or age, may be better provided with realistic sets of opportunities to build knowledge and skills which will sustain them throughout their working lives.

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